

**Claims:**

1        1. A method of filling a hole through a dielectric layer in an integrated circuit, comprising:  
2            a) depositing a generally conformal first barrier layer in the hole;  
3            b) removing the first barrier layer formed on the bottom of the hole;  
4            c) sputter depositing a second barrier layer under conditions of a high density plasma;  
5        and  
6            d) depositing a metal layer in the hole.

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2 9. The method of claim 8 wherein the second barrier layer comprises a material selected from  
3 the group consisting of Ta, TaN, TaSiN, TiSiN and combinations thereof.

1 10. The method of claim 9 wherein the metal layer sputter deposited in the hole is copper.

1 11. The method of claim 10 wherein the second barrier layer is sputter deposited under the  
2 conditions of a high density plasma.

1 12. The method of claim 11 wherein the metal is sputter deposited under the conditions of a high  
C2 density plasma.

1 13. The method of claim 12 wherein the metal is heated to a temperature of between about room  
2 temperature and about 500°C and then subjected to a pressurized environment.

1 14. The method of claim 13 wherein the pressurized environment is in the range of about 1000  
2 psi to about 100,000 psi.

1 15. A method of filling a hole through a dielectric layer in an integrated circuit, comprising:  
2 a) depositing a first barrier layer over a blanket dielectric layer;  
3 b) forming a hole through the barrier layer and the dielectric layer to expose an  
4 underlayer;  
5 c) depositing a second generally conformal barrier layer in the hole;  
6 d) removing the barrier layer formed at the bottom of the hole;  
7 e) selectively depositing a metal layer in the hole.

1 16. The method of claim 15 wherein the first barrier and second barrier layers are comprised of

2  $\text{Si}_x\text{N}_y$ .

1 17. The method of claim 16 wherein the first and second barrier layers are formed using chemical  
2 vapor deposition techniques.

1 18. The method of claim 17 wherein the barrier layer formed on the bottom of the hole is  
2 removed by sputter etching techniques.

1 19. An integrated processing tool, comprising:

2 a central transfer chamber having a robot assembly disposed at least partially therein for  
3 moving substrates;

4 a chemical vapor deposition chamber for depositing  $\text{Si}_x\text{N}_y$ ;

5 a high density plasma physical vapor deposition chamber connected to the transfer chamber  
6 having a target comprising tantalum;

7 an etch chamber capable of achieving a high density plasma; and

8 a high density plasma physical vapor deposition chamber connected to the transfer chamber  
9 having a target comprising copper.

1 20. The method of claim 5 wherein the metal layer is deposited by first depositing a wetting layer  
2 using chemical vapor deposition techniques and then filling the hole using physical vapor deposition  
3 techniques.

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